Lightweight and Energy Efficient Heat Pump, Phase II

Completed Technology Project (2009 - 2010)

Project Introduction

Future Spacecraft from the JPL will require increasingly sophisticated thermal control technology. A need exists for efficient, lightweight Vapor Compression Cycle (VCC) systems, for medium-to-low cooling loads (less than 2kW). While conventional VCC technology is relatively compact and efficient for multi-kW loads, it is difficult to find a system that strikes a balance between coefficient of performance, weight and size within the sub-kW range. The particular system proposed will be a highly efficient Mini-Heat Pump featuring custom compressor and heat-exchanger technology. The compressor is a highly efficient, high power density, orientation independent rotary compressor designed for 500W of heat removal, a temperature lift of 50K and with a Coefficient of Performance (COP) of 2. In the Phase II effort RINI proposes to continue development of the Mini-Heat Pump to increase compressor performance, study long term reliability, and design, build and test a deliverable prototype. Detailed compressor analysis will be performed, and the results will be applied to a compressor that will be integrated with a motor identified in Phase I for use with the heat exchangers from the Phase I. The Phase II effort will result in delivery of an efficient, lightweight, orientation independent, reliable and compact prototype heat pump for NASA missions.

Primary U.S. Work Locations and Key Partners

Lightweight and Energy Efficient Heat Pump, Phase II

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Rini Technologies, Inc.	Supporting Organization	Industry	Orlando, Florida

Primary U.S. Work Locations	
California	Florida

Project Transitions

February 2009: Project Start

August 2010: Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.1 Cryogenic Systems
    - TX14.1.1 In-space Propellant Storage & Utilization